100/100 MARKS

ARTHAM
RESOURCE MATERIAL
NCERT EDUCATIONAL RESOURCES

NCERT

CHAPTER WISE

TOPIC WISE

LINE BY LINE QUESTIONS

2024

BY
SCHOOL OF
EDUCATORS

Units And Measurments

Physical Quantity

- Quantities which can be measured by an instrument and used to describe laws of physics are physical quantities
- Physical quantity = Numerical value (N) × Unit (U)

Numerical Value → 45 kg ← Unit

TYPES

Fundamental quantities do not depend upon other quantities:
(1) Length (2) Mass (3) Time (4) Temperature (5) Amount of Substance (6) Electric current (7) Luminous Intensity

- Derived quantities are formed by combining more than one fundamental physical quantities
- Area, Volume, Velocity and acceleration are some Derived quantities

Two Supplementary S.I units are:-

(1) Radian(Plane angle) . $\theta = \frac{\text{arc}}{\text{radius}}$

(2) Steradian (Solid angle). $\Omega = \frac{\text{arc}}{(\text{radius})^2}$

UNITS

(1) Unit is defined as the reference standard used for measurements.
(2) Measurements consists of a numerical value along with a relevant unit.
(3) Example: meter, Newton, Joule, Seconds etc.

MKS (m, kg, S) | CGS (m, gm, S) | FPS (ft, pound, S)

S.I Units

- The system of units accepted internationally
- S.I units of time is 'Sec' is the example of S.I system

Dimensional Analysis

Dimension formula is the expression for the unit of a physical quantity in terms of the fundamental quantities

Dimensional formula is expressed in terms of power of M, L and T.

Primary or Fundamental Dimensional Formula

There are seven fundamental dimensional formulas:
(1) Mass = (M). (2) Length = (L). (3) Time = (T). (4) Temperature = (K) or (Q). (5) Electric Current = (I). (6) Luminous Intensity = (cd). (7) Amount of Matter = (mol)

Secondary or derived dimensional formula

(i) Other than Fundamental formula all other are derived dimensional formula
(ii) example: (1) (Speed) = (MoL1T-1).
(2) (Acceleration) = (MoL1T2)

Conversion of Units from are system to another

$$N_2 = N_1 \left[\frac{M_1}{M_2}\right]^a \left[\frac{L_1}{L_2}\right]^b \left[\frac{T_1}{T_2}\right]^c$$

N1 = Numerical part of one system
N2 = Numerical part of another system

PRINCIPLE OF HOMOGENITY

Principle of homogeneity states that the dimension of each term on both sides of dimensional equation should be same.

ORDER OF MAGNITUDE

It is defined as the power of 10 which is closest to its magnitude

N = N × 10x: x = order of magnitude.

coefficient, exponent: 6.022×10^{23} (base)

KNOW YOUR LCROS (SIGNIFICANT FIGURES)

The number of digits in the measured values about the correctness are known as significant figures.

Trailing zero digits are significant only when they appear after decimal 4.00 - 3 Sf: 0.043010 - 5 Sf

SOME OTHER UNITS

(1) mass:- 1 quintal = 100 kg, 1 ton = 1000 kg
(2) length:- 1 light year = 9.46 × 1015 m, 1 au = 1.496 × 1011 m
(3) Temperature: 0o C = 273 K 1o f = 255.928 K

All non – zero digits are significant
4.125 - 4 Sf:
123 - 3 Sf

Leading zeroes i.e . are never significant placed to the left of the number
0.0403 - 3 Sf:
0.04030 - 4 Sf

10.9 - 3 Sf:
400.001 - 4 Sf

All zero lie in between the non – zero digits are significant

Order of magnitud e is not considered
38.3 × 104 - 3 Sf:
38.30 × 10-9 - 4 Sf

Constants and pure numbers have infinite significant figures:

RULE OF ROUNDING OFF

- Rules of Rounding off the uncertain digits (up to 3 significant Figures)

If digit > 5 then, preceding digit +1

If digit <5 then, preceding digit remain same

If insignificant digit = 5:
(a) Preceding digit remain same when rounded off digit is even.:
(b) Preceding digit +1 when rounded off digit is odd

ACCURACY

Accuracy is degree of closeness of measured value to the true value: Shows that how closely the results with the standard value.

PRECCISION

Precision is the range of variation of true value during several observation

ERRORS

The uncertainty in measurement is called errors
- Error = true value – measured value

TYPES OF ERROR

Absolute Error. = true value – measured value

Mean absolute errors

$$\Delta\alpha_{mean} = \frac{|\Delta\alpha_1| + |\Delta\alpha_2| + \ldots\ldots\ldots + |\Delta\alpha_n|}{n}$$

Relative error

$$\frac{\Delta\alpha_{mean}}{\alpha_{mean}}$$

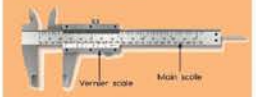
Percentage error.

is difference the measured value and the true value as a percentage of true value
Percentage error

$$\frac{\Delta\alpha_{mean}}{\alpha_{mean}} \times 100$$

VERNIER CALLIPERS

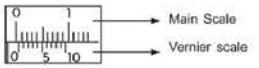
Least Count (L.C) = 1 MSD – 1 VSD: MSD = Main Scale division: VSD = Vernier Scale division



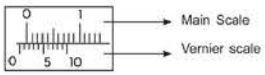
Total reading = Main Scale Reading +(Vernier Coincidence × least Count)

Zero error = N × L.C: N = No. of coinciding division: L.C = Least count of an instrunment.

POSITIVE ZERO ERROR



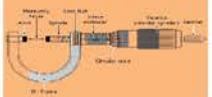
NEGATIVE ZERO ERROR



Pitch =

$$\frac{\text{displacement of screw}}{\text{no. of rotations}}$$

$$L.C. = \frac{\text{Pitch}}{\text{total no. of divisions}}$$

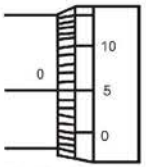


Zero error = N × L.C

N = No. of circular Scale division that coincides with the reference line

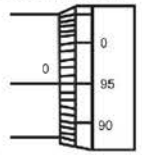
L.C = Least Count

POSITIVE ZERO ERROR



Positive Zero Error

NEGAITIVE ZERO ERROR



Negative Zero Error

NCERT LINE BY LINE QUESTIONS

1. Natural sciences does not include
   (a) Physics (b) Chemistry (c) Biology (d) Social Science
2. Principal thrusts in Physics are
   (a) Unification (b) Reduction (c) Both (a)and (b) (d) None of the above
3. Attempt to explain diverse physical phenomenon in terms of a few concepts and laws is called
   (a) Unification (b) Reduction (c) Fusion (d) All of the above
4. Classical Physics mainly deals with
   (a) Microscopic phenomenon (b) Macroscopic phenomenon
   (c) Atomic phenomenon (d) Heisenberg's uncertainty principle
5. Among the following, choose the incorrect statement
   (a) The microscopic domain of physics deals with the constitution and structure of matter at the minute scales of atoms and nuclei
   (b) Classical Physics deals mainly with macroscopic phenomena and includes subjects like Mechanics, Electrodynamics, Optics and Thermodynamics
   (c) Both of the above (d) None of the above
6. Phenomenon of neutron induced fission of uranimum, which serves as a basis of nuclear power reactors and nuclear weapons, was discovered by
   (a) Hahn and Meitner (b) Einstein
   (c) Neils Bohr (d) Nicholas Tesla
7. Among the following, the scientists are matched with their major contribution or discovery. Which among the following is incorrectly matched?
   A) Archimedes Principle of Buoyancy
   B) Christiaan Huygens Wave Theory of Light
   C) JCBose X-rays
   D) Albert Einstein Theory of Relativity
   (a) A (b)B (c)C (d)D
8. Among the following scientists, the one who is credited for the contribution to theory of condensed matter is
   (a) Ernest Orlando Lawrence (b) C-V. Raman
   (c) Ernest Rutherford (d) Lev Davidovich Landau
9. Full form of LASER is
   (a) Light amplification by shorted extraction of rays
   (b) Light amplification by stimulated emission of radiation
   (c) Long absorption of silent extraction of radiation
   (d) None of the above
10. Choose the incorrect statement among the following in relation to the electromagnetic waves.
    (a) Electromagnetic force do not require intervening medium
    (b) They act over large distances
    (c) Electromagnetic force is weaker than the gravitational forces
    (d) Etectromagnetc forces may be attractive or repulsive

11. Choose the correct option.
    (1)A most precise measurement may be most accurate
    (2) A most precise measurement will necessarily be most accurate
    (3) A most precise measurement will be less accurate
    (4) A most accurate measurement will necessarily be most precise
12. 1 metre is the length of path travelled by light in vacuum during a time interval of of a second of a second of a second of a second
    1) $\frac{1}{299,972,458}$ of a second
    2) $\frac{1}{299,792,548}$ of a second
    3) $\frac{1}{299,792,458}$ of a second
    4) $\frac{1}{299,792,854}$ of a second
13. The kelvin is the fraction
    1) $\frac{1}{273}$ of the thermodynamic temperature of triple point of water
    2) $\frac{1}{312}$ of the thermodynamic temperature of triple point of water
    3) $\frac{1}{273.16}$ of the thermodynamic temperature of triple point of water **i**
    4) $\frac{1}{273}$ of the thermodynamic temperature of triple point of mercury
14. 1" (second of arc) in radian is (approximately)
    (1) 5.85×10^{-6} rad
    (2) 8.55×10^{-6} rad
    (3) 5.85×10^{-5} rad
    (4) 4.85×10^{-6} rad
15. The diameter of sun is 1.39×10^{9} m. The distance of sun from earth is 1.496×10^{11} m. The angular diameter of sun is
    (1) 1290"
    (2) 9210"
    (3) 2190'
    (4) 1920"
16. The measured length of two rods are l_1 = 30 cm ± 0-5 cm and l_2= 20 cm + 0.1 cm. The percentage error in difference of length of rods is
    (1) 6%
    (2) 4%
    (3) 5%
    (4) 3%
17. Two resistors of resistances R_1 = 300 ± 3 ohm and R_2 = 200 ± 2 ohm are connected in parallel. The equivalent resistance of parallel combination with error is
    (1) [120 ± 1.8] ohm
    (2) (120 ± 1]ohm
    (3) [120 ±1.6] ohm
    (4) [120 ±2.0] ohm
18. If percentage error in measurement of quantities A, B. C and D are 1 %, 2%. 3% and 4% respectively, then percentage error in measurement of $z=\frac{A^2B^{1/2}}{C^{1/3}D^{1/4}}$ is
    (1) 5%
    (2) 4%
    (3) 6%
    (4) 8%
19. The number of insignificant zeros in 0.0048050
    (1) 1
    (2)2
    (3)3
    (4)4
20. The value of $(3.8\times10^{3}+3.5\times10^{2})$ with regards to significant figure is
    (1) 7.3×10^{5}
    (2) 4.2×10^{3}
    (3) 4.15×10^{3}
    (4) 7.3×10^{3}

21. The value of gravitational constant is $G = 6.67\times10^{-11}\frac{N\times m^2}{kg^2}$ Suppose we employ a new system of units in which unit of mass is **u** kg, the unit of length β m and the unit of time is γ s. The value of gravitational constant in terms of new units is

(1) $6.67\times10^{-11}\alpha\beta^{-3}\gamma^2$ (2) $6.67\times10^{-11}\alpha^{-1}\beta^{3}\gamma^{-2}$

(3) $6.67\times10^{-11}\alpha\beta^{3}\gamma^{2}$ (4) $6.67\times10^{-11}\alpha^{-1}\beta^{-3}\gamma^{2}$

22. In Cesium clock 1 second is the time in which cesium - 133 atom, vibrate between two hyperfine levels

(1) 9,292, 631, 770 times (2) 9, 192, 361, 770 times

(3) 9, 192, 136, 770 times (4) 9,192, 631,770 times

23. Least count error belongs to the category of

(1) Random error only (2) Systematic error only

(3) Neither systematic error nor-random error

(4) Systematic and random error both

24. A student measures the period of oscillation of a simple pendulum in successive measurements, the reading turn out to be 1.93 s, 1.99 s, 2.06 s, 2.08 s and 1.95 s. A more accurate way to write the measurement with error is

(1) (2.00 ± 0.05) s (2) (2.03 + 0.06) s (3) (2.0 ± 0.06) s (4) (2.03 ± 0.1) s

25. Each side of a cube is measured to be 6.372 m. The total surface area of cube with appropriate significant figures is

(1) $2.5\times10^2\ m^2$ (2) $2\times10^2\ m^2$ (3) 243.6 m^2 (4) 251.3207 m^2

26. Choose the correct statement

(1) A dimensionally correct equation need not be an actually correct equation

(2) A dimensionally correct equation may be an actually correct equation

(3) A dimensionally incorrect equation may be correct (4) Both (i)and (2)

27. A famous relation in physics with many printing errors, relates the moving mass '*m*' with rest mass for a moving object with speed *v* is printed as $m = \frac{n_0^2}{\sqrt{1-\frac{b}{c^2}}}$. The dimensional formula of n_0 and b are respectively (c is speed of light)

(1) $[M],[LT^{-1}]$ (2) $[M],[L^{-2}T^{-2}]$ (3) $[M^{½}],[L^2T^2]$ (4) $[M^{½}],[LT^{-1}]$

28. Parsec is a unit of (NCERT Pg. 21]

(1) Distance (2) Velocity (3) Time (4) Angle

29. If the size of atom is in the range of 10^{-10} m to 10^{-9} m is scaled up to the tip of sharp pin (assume tip of pin to be in the range of $l0^{-6}$ to 10^{-5}m), Roughly, size of nucleus is

(1) 0.1 A (2) 0.01 A (3) 0.001 A (4) 10 A

30. In a screw gauge, each main scale division is 1 mm and there are 200 divisions on the circular scale. The least count of screw gauge is

(1) 0.05 mm (2) 0.005 mm (3) 0.05 cm (4) 0.005 cm

NCERT BASED PRACTICE QUESTIONS

1. Angle is a

(a) fundamental quantity (b) derived quantity

(c) supplementary quantity (c) None of these

2. Parallax method is used for measurement of
(a) length (b) time (c) mass (d) speed

3. 1 astronomical unit (AU) is equal to
(a) 1.496×10^{18}m (b) 1.496×10^{15}m
(c) 1.496×10^{11}m (d) 1.496×10^{9}m

4. Parsec is a unit for measurement of
(a) Time (b) Length (c) Mass (d) none of these

5. Light year is used to measure
(a) time (b) length (c) mass (d) None of these

6. 1atomic mass unit (1 amu) is equal to
a) 1.66×10^{-27}kg (b) 1.66×10^{-24}kg
(c) 1.66×10^{-22}kg (d) 1.66×10^{-23}kg

7. 0.002308 has significant figure
(a) 4 (b) 6 (c) 7 (d) 3

8. Significant figure in 0.06900 are
(a) 2 (b) 3 (c) 4 (d) 5

9. Dimension of $\frac{1}{2}\in oE^2$ is ($\in_0\rightarrow$ permittivity of free space, E- electric field)
(a) $ML^{-1}T^{-2}$ (b) ML^2T^{-2} (c) $ML^{-1}T^{-1}$ (d) ML^2T^{-1}

10. Dimension of $\frac{B^2}{2\mu_0}$ is(B$\rightarrow$ magnetic field, $\mu_0\rightarrow$ *permiability of frees pace*)
(a) ML^2T^{-2} (b) $ML^{-1}T^{-1}$ (c) ML^2T^{-1} (d) $ML^{-1}T^{-2}$

11. Dimension of $\frac{1}{\sqrt{\mu_0\in_0}}$ is
(a) $[MLT^{-2}]$ (b) $M^0L^1T^{-2}$ (c) $M^0L^1T^{-1}$ (d) $M^0L^{-1}T^{-1}$

12. Dimension of $\frac{\upsilon^2}{rg}$ is same as of, υ (υ is velocity, r $\rightarrow$ radius, g-acceleration due to gravity)
(a) angle (b) acceleration (c) length (d) speed

13. Dimension of coefficient of viscosity is
(a) $[ML^2T^{-1}]$ (b) $ML^{-1}T^{-1}$ (c) MLT^{-2} (d) $M^{-1}L^{-1}T^{-1}$

14. Dimension of planck constant is
(a) $[ML^2T^{-2}]$ (b) $[MLT^{-2}$ (c) ML^2T^{-1} (d) None of these

15. Dimension of strain is:.
(a) $[M^0LT^0]$ (b) $[M^0L^{-1}T^0]$ (c) $[M^1L^0T^0]$ (d) $[M^0L^0T^0]$

16. Dimension of surface tension is
(a) $[ML\,T^{-2}]$ (b) $[ML^0T^{-2}]$ (c) $[ML^0T^{-1}]$ (d) $[MLT^{-1}]$

17. Dimension of efficiency is
(a) $[M^0LT^0]$ (b) $[M^0L^{-1}T^0]$ (c) $[M^0L^0T^{-0}]$ (d) $[M^1L^0T^0]$

18. Dimension of $\frac{1}{2}Li^2$ is
(a) $[ML^2T^{-2}]$ (b) $[M\,LT^{-2}]$ (c) $[ML^2T^{-1}]$ (d) $[ML^{-1}T^{-2}]$

19. Dimension of $\frac{1}{2}Cv^2$
(a) $[ML^2T^{-2}]$ (b) $[M\,LT^{-2}]$ (c) $[ML^2T^{-1}]$ (d) $[ML^{-1}T^{-2}]$

20. Dimension of $\frac{Q_2}{2C}$ *is* $Q\rightarrow charge$, $C\rightarrow capacitance$
(a) $[MLT^{-2}]$ (b) $[ML^2T^{-2}]$ (c) $[ML^2T^{-1}]$ (d) $[ML^{-1}T^{-2}]$

21. A physical quantity P is related to four observables a,b,c and d as follows P $\frac{a^3b^2}{\sqrt{cd}}$ percentage error in a,b,c,d are 1%,3%,4% and 2% respectively. Percentage error in quantity P is.
(a) 10% (b) 15% (c) 13% (d) 8%

22. Area enclosed by a circle of diametric 1.06m is
(a) 0.88 2026 m^2 (b) 0.882 m^2 (c) 0.88 m^2 (d) none of these

23. A body travels uniformly a distance of (13.8± 0.2)m in time (4.0 ± 0.3) S. Percentage error in measurement of velocity is
(a) 9% (b) 7% (c) 5% (d) 3%

24. One shake is equal to
(a) 10^8sec (b) 10^{-9}sec (c) 10^{-8}sec (d) 10^{-10}sec

25. Ratio of SI to c.g.s units of KE is
(a) 10^6 (b) 10^{-7} (c) 10^7 (d) 10^8

26. Which of the following have same dimensions?
(a) specific heat
(b) Momentum and impulse
(c) Moment of inertia and angular momentum
(d) Tension and surface tension

27. The dimensions of magnetic moment are
(a) L^2A^{-1} (b) L^2A^1 (c) LA^2 (d) L^2A^{-3}

28. The unit of reduction factor of tangent of galvanometer is
(a) gauss (b) tesla (c) radian (d) ampere

29. The dimensions of the gravitational constant G are
(a) $[ML^{-1}T^{-1}]$ (b) $[MLT^2]$ (c) $[M^{-1}L^3T^{-2}]$ (d) $[M^2L^{-1}T^2]$

30. If L and R denote inductance and resistance respectively, which of the following dimensions of frequency?
(a) $\frac{R}{L}$ (b) $\frac{L}{R}$ (c) $\sqrt{\frac{R}{L}}$ (d) $\sqrt{\frac{L}{R}}$

31. The dimensional formula of magnetic flux is
(a) $[M^1L^2T^{-2}A^{-1}]$ (b) $[M^1L^0T^{-2}A^{-2}]$ (c) $[M^0L^{-2}T^{-2}A^{-2}]$ (d) $[M^1L^2T^{-1}A^3]$

32. Which one of the following has the dimension of pressure?
(a) $\frac{ML}{T^2}$ (b) $\frac{M}{L^2T^2}$ (c) $\frac{M}{LT^2}$ (d) $\frac{M}{LT}$

33. Which of the following has metre Kelvin as the unit?
(a) Rydberg constant (b) wein's constant
(c) Solar constant (d) gas constant

34. Dimension of $\frac{L}{RCV}$ are
(a) A^{-1} (b) A^{-2} (c) A (d) A^2

35. The dimension of intensity are
(a) $L^0M^1T^{-3}$ (b) $L^1M^2T^{-2}$ (c) $L^2M^1T^{-2}$ (d) $M^2L^2T^{-3}$

36. The dimension of RC, R is resistance and C is capacitances are same as that of
(a) inverse time (b) time
(c) square of time (d) square root of time

37. Which of the following is a dimensional constant?
(a) refractive index (b) dielectric constant
(c) relative density (d) gravitational constant

38. The length of a rod is (11.05 ± 0.05) cm. What is the total length of 2 such rods?
(a) (22.1 ± 0.05)cm (b) (22.10 ± 0.05)cm
(c) (22.100 ± 0.05)cm (d) (22.10 ± 0.10)cm

39. Which of the following quantity can be written in SI unit Kg m^2 A^{-2} S^{-3}
(a) Resistance (b) Inductance
(c) Capacitance (d) magnetic flux

40. The dimension of $\frac{L}{R}$ is same as that of
(a) Time (b) Speed (c) Inverse of time (d) square of time

TOPIC WISE PRACTICE QUESTIONS

Topic 1: Units of Physical Quantities

1. Unit of specific resistance is
1) ohm/m^2 2) ohm m^3 3) ohm – m 4) ohm/m

2. Temperature can be expressed as derived quantity in terms of
1) Length and mass 2) mass and time 3) length, mass and time 4) none of these

3. Potential is measured in
1) joule/coulomb 2) watt/coulomb 3) newton-second 4) none

4. The siemen is the SI unit of
1) Resistivity 2) Resistance 3) conductivity 4) conductance

5. What is the unit of magnetic permeability?
1) Wb A-1 m^{-1} 2) Wb^{-1} Am 3) Wb A m^{-1} 4) Wb A^{-1} m

6. The SI unit of coefficient of mutual inductance of a coil is
1) henry 2) volt 3) farad 4) weber

7. Surface tension of a liquid is 70 dyne/cm. Its value in SI is
1) 70 N/m 2) 7 x 10^{-2} N/m 3) 7 x 10^2 N/m 4) 7 X 10^3 N/m

8. Joule - second is a unit of
1) energy 2) torque 3) power 4) angular momentum

9. The unit of the Stefan-Boltzmann's constant is
1) W/m^2K^4 2) W/m^2 3) W/m^2K 4) W/m^2K^2

10. Young's modulus of steel is 1.9 x 10^{11} N/m^2. When expressed in CGS units of dyne/cm^2, it will be equal to (1N = 10^5 dyne, 1 m^2 = 10^4 cm^2)
1) 1.9x10^{10} 2) 1.9 x 10^{11} 3) 1.9x10^{12} 4) 1.9x10^{13}

11. Which one of the following pairs of quantities and their units is a proper match?
1) Impulse – N/sec 2) Magnetic flux – weber 3) Power – farad 4) Capacitance – henry

12. The numerical values of young's modulus in S.I. unit is β. What is its numerical value in cgs system?
1) β 2)10 β 3) $\beta/10$ 4) 100 β

13. In the eqn. $\left(P+\frac{a}{V^2}\right)(V-b)$ = constant, the unit of a is
1) Dyne × cm^5 2) dyne × cm^4 3) dyne/cm^3 4) dyne × cm^2

14. In C.G.S. system the magnitude of the force is 100 dynes. In another system where the fundamental physical quantities are in kilogram, metre and minute, the magnitude of the force is
1) 0.036 2) 0.36 3) 3.6 4) 36

15. If e is the charge, V the potential difference, T the temperature, then the units of $\frac{eV}{T}$ are the same as that of
1) Planck's constant 2) Stefan's constant 3) Boltzmann's constant 4) gravitational constant

16. In equation, r = $m^2 \sin \pi t$, where t represents time, If the unit of m is N. Then the unit of r is
1) N 2) N^2 3) Ns 4) N^2s

17. If $x = at + bt^2$, where x is the distance travelled by the body in kilometres while T is the time in seconds, then the unit of B is
1) km/s 2) kms 3) km/s^2 4) kms^2

18. Which of the following quantities has not been expressed in proper unit?
(a) torque : newton metre
(b) stress : newton $metre^{-2}$
(c) modulus of elasticity : newton $metre^{-2}$
(d) surface tension : newton $metre^{-2}$

19. If unit of length and force are increased 4 times. The unit of energy
1) is increased by 4 times 2) is increased by 16 times
3) is increased by 8 times 4) remains unchanged

20. The density of a material in CGS system is 8 g / cm^3. In a system of a unit in which unit of length is 5 cm and unit of mass is 20 g, the density of material is
1) 8 2) 20 3) 50 4) 80

Topic 2: Errors in Measurements and Significant Figures

21. The random errors can be reduced by
1) Taking more number of observation 2) eliminating the error
3) not taking more care 4) None of these

22. Error in the measurement of radius of a sphere is 1%. Then error in the measurement of volume is
1) 1% 2) 5% 3) 3% 4) 8%

23. If x = a - b, then the maximum percentage error in the measurement of x will be
1) $\left(\frac{\Delta a}{a}+\frac{\Delta b}{b}\right)\times 100\%$ 2) $\left(\frac{\Delta a}{a}-\frac{\Delta b}{b}\right)\times 100\%$ 3) $\left(\frac{\Delta a}{a-b}+\frac{\Delta b}{a-b}\right)\times 100\%$ 4) $\left(\frac{\Delta a}{a-b}-\frac{\Delta b}{a-b}\right)\times 100\%$

24. Number of significant figures in expression $\frac{4.327g}{2.51cm^3}$ is
1) 2 2) 4 3) 3 4) 5

25. If the percentage errors of A, B and C are a, b and c respectively, then the total percentage error in the product ABC is
1) abc 2) a + b + c 3) $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}$ 4) $ab+bc+ca$

26. The maximum error in the measurement of mass and density of a cube are 3% and 1% respectively. The maximum error in the measurement of volume will be
1) 1% 2) 2% 3) 3% 4) 4%

27. The value of resistance is 10.845 Ω and the value of current is 3.23 A. The potential difference is 35.02935 volt. Its value in significant number would be

1) 35 V 2) 35.0 V 3) 35.03 V 4) 35.029 V

28. A body of mass m = 3.513 kg is moving along the x-axis with a speed of 5.00 ms^{-1} . The magnitude of its momentum is recorded as

1) 17.6 kg ms-1 2) 17.565 kg ms-1 3) 17.56 kg ms-1 4) 17.57 kg ms-1

29. What is the fractional error in g calculated from $T = 2\pi\sqrt{l/g}$? Given fraction errors in T and l are $\pm$ x and $\pm$ y respectively.

1) x + y 2) x - y 3) 2x + y 4) 2x - y

30. The dimensions of a rectangular block measured with callipers having least count of 0.01 cm are 5 mm x 10 mm x5 mm. The maximum percentage error in the measurement of the volume of the block is

1) 5% 2) 10% 3) 15% 4) 20%

31. The length of one rod l_1 = 3.323 cm and the other is l_2 = 3.321 cm. Both rods were measured with one measuring instrument with least count 0.001 cm then $(l_1 - l_2)$ is

1) (0.002 0.001) cm 2) (0.002 0.000) cm 3) (0.002 0.002) cm 4) None of these

32. Relative density of a metal may be found with the help of spring balance. In air the spring balance reads (5.00 ± 0.05) N and in water it reads (4.00 ± 0.05) N. Then, the relative density along with the maximum permissible percentage error is

1) (5.00 ± 0.05)N 2) (5.00 ± 11%) 3) (5.00 ± 0.10) 4) (5.00 ± 6%)

33. A physical quantity X is represented by X = (M^x L^{-y} T^{-z}). The maximum percentage errors in the measurement of M, L and T respectively are a%, b% and c%. The maximum percentage error in the measurement of X will be

1) (ax + by - cz)% 2) (ax - by - cz)% 3) (ax + by + cz)% 4) (ax - by + cz)%

34. The percentage errors in the measurement of mass and speed are 2% and 3% respectively. The error, in kinetic energy obtained by measuring mass and speed, will be

1) 12 % 2) 10 % 3) 8 % 4) 2 %

35. The least count of a stop watch is1/5 s. The time of 20 5 oscillations of a pendulum is measured to be 25 s. What is the maximum percentage error in this measurement?

1) 8 % 2) 1 % 3) 0.8 % 4) 16 %

36. The internal and external diameter of a hollow cylinder are measured with the help of vernier callipers. Their values are 4.23 ± 0.01 cm and 3.87 ± 0.01 cm respectively. The thickness of the wall of the cylinder is

1) 0.36 ± 0.02 cm 2) 0.18 ± 0.02 cm 3) 0.36 ± 0.01 cm 4) 0.18 ± 0.01 cm

37. The diameter of a sphere is measured with an instrument having least count 0.001 cm. The diameter is 1.933 cm. The radius to correct significant figures will be

1) 0.965 cm 2) 0.966 cm 3) 0.967 cm 4) None of these

38. A physical quantity is given by X = M^a L^b T^c. The percentage error in measurement of M, L and T are , and respectively. Then maximum percentage error in the quantity X is

1) a + b + c 2) a + b -c 3) a b 2 4) None of these

39. In a simple pendulum experiment for the determination of acceleration due to gravity, time period is measured with an accuracy of 0.1% while length was measured with an accuracy of 0.3%. The percentage accuracy in the value of g so obtained is

1) 0.8% 2) 0.7% 3) 0.5% 4) 0.6%

40. The relative error in the determination of the surface area of a sphere is α. Then the relative error in the determination of its volume is

1) $\frac{2}{3}\alpha$ 2) $\frac{2}{3}\alpha$ 3) $\frac{3}{2}\alpha$ 4) α

41. The density of a cube is measured by measuring its mass and length of its sides. If the maximum error in the measurement of mass and length are 4% and 3% respectively, the maximum error in the measurement of density will be
1) 7% 2) 9% 3) 12% 4) 13%

42. The refractive index of water measured by the relation $\mu = \frac{real\ depth}{apparent\ depth}$ is found to have values of 1.34, 1.3 8, - apparent depth 1.32 and 1.36; the mean value of refractive index with percentage error is
1) 1.35 ± 1.48 % 2) 1.35 ± 0 % 3) 1.36 ± 6 % 4) 1.36 ± 0 %

43. A wire has a mass 0.3 ± 0.003 g, radius 0.5 ± 0.005 mm and length 6 ± 0.06 cm. The maximum percentage error in the measurement of its density is
1) 1 2) 2 3) 3 4) 4

44. The pressure on a square plate is measured by measuring the force on the plate and length of the sides of the plate by F using the formula $P = \frac{F}{l^2}$. If the maximum errors in the 2 measurement of force and length are 4% and 2% respectively, then the maximum error in the measurement of pressure is
1) 1% 2) 2% 3) 8% 4) 10%

45. A thin copper wire of length l metre increases in length by 2% when heated through 10°C. What is the percentage increase in area when a square copper sheet of length l metre is heated through 10°C?
1) 4% 2) 8% 3) 16% 4) 12%

46. Intensity observed in an interference pattern is $I = I_O \sin^2\theta$ at $\theta = 30^0$ intensity $I = 5 \pm 0.0020 W/m^2$. Find percentage error in angle, if I_0 = 20 W/m2.
1) $\frac{4}{\pi}\sqrt{3}\times10^{-2}\%$ 2) $\frac{2}{\pi}\sqrt{3}\times10^{-2}\%$ 3) $\frac{1}{\pi}\sqrt{3}\times10^{-2}\%$ 4) $\frac{3}{\pi}\sqrt{3}\times10^{-2}\%$

47. If $f = x^2$, then the relative error in f is
1) $\frac{2\Delta x}{x}$ 2) $\frac{(\Delta x)^2}{x}$ 3) $\frac{\Delta x}{x}$ 4) $(\Delta x)^2$

48. Mass of a body is 210 gm and its density is 7.981 g/cm^3 what will be its volume, with regard to significant digits?
1) 26.312 cm^3 2) 26 cm^3 3) 27 cm^3 4) 26.3cm^3

Topic 3: Dimensions of Physical Quantities

49. Which of the following set have different dimensions?
(1) Pressure, Young's modulus, Stress (2) EMF, Potential difference, Electric potential
(3) Heat, Work done, Energy (4) Dipole moment, Electric flux, Magnetic field

50. Which of the following is a dimensional constant?
(1) Refractive index (2) Dielectric constant (3) Relative density (4) Gravitational constant

51. Let Q denote the charge on the plate of a capacitor of capacitance C. The dimensional formula for $\frac{Q^2}{C}$ is
1) $\left[L^2M^2T\right]$ 2) $\left[LMT^2\right]$ 3) $\left[L^2MT^{-2}\right]$ 4) $\left[L^2M^2T^2\right]$

52. Dimensions of 'resistance' are same as (where h is Planck's constant and e is charge)
1) h/e 2) h^2/e 3) h/e^2 4) h^2/ e^2

53. The Solar constant is defined as the energy incident per unit area per second. The dimensional formula for solar constant is

1) $\left[M^0L^0T^0\right]$ 2) $\left[MLT^{-2}\right]$ 3) $\left[ML^2T^{-2}\right]$ 4) $\left[ML^0T^{-3}\right]$

54. The dimensions of physical quantity X in the equation Force $=\frac{X}{Density}$ is given by

1) $\left[ML^4T^{-2}\right]$ 2) $\left[M^2L^{-2}T^{-1}\right]$ 3) $\left[M^2L^{-2}T^{-2}\right]$ 4) $\left[ML^{-2}T^{-1}\right]$

55. Which of the following units denotes the dimension $\frac{ML^2}{Q^2}$, where Q denotes the electric charge?

1) Wb/m^2 2) Henry (H) (3) H/m2 (4) Weber (W2)

56. Which of the following has the same dimensions?

(1) Impulse and momentum (2) Specific heat and latent heat

(3) Moment of inertia and force (4) Thrust and surface tension

57. The dimensions of voltage in terms of mass (M), length (L) and time (T) and ampere (1) are

1) $\left[ML^2T^{-2}A^{-2}\right]$ 2) $\left[ML^2T^3A^{-1}\right]$ 3) $\left[ML^2T^{-3}A^1\right]$ 4) $\left[ML^2T^{-3}A^{-1}\right]$

58. If L denotes the inductance of an inductor through which a current i is flowing, the dimensions of Li^2 are

1) $\left[ML^2T^{-2}\right]$ 2) $\left[MLT^{-2}\right]$ 3) $\left[M^2L^2T^{-2}\right]$ 4) not expressible in M, L, T

59. The displacement of a body at a particular second n is given by the expression $S_{nth}=u+\frac{a}{2}(2n-1)$. The dimensional formula of S_{nth} in this equation is

1) $\left[M^1L^0T^1\right]$ 2) $\left[M^0L^1T^0\right]$ 3) $\left[M^0L^1T^{-1}\right]$ 4) $\left[M^0L^0T^0\right]$

60. In the equation $P=\frac{RT}{V-b}e^{\frac{aV}{RT}}$ V = volume, P = pressure, R = universal gas constant, and T = temperature. The dimensional formula of a is same as that of

(1) V (2) P (3) T (4) R

61. Time (T), velocity (3) and linear momentum (h) are chosen as fundamental quantities instead of mass, length and time. In terms of these, the dimensions of mass would be:

1) $[M]=\left[C^{-1}h\right]$ 2) $[M]=\left[T^{-1}C^2h\right]$ 3) $[M]=\left[T^{-1}C^{-2}h^{-1}\right]$ 4) $[M]=\left[C^{-2}h\right]$

62. Suppose the kinetic energy of a body oscillating with amplitude A and at a distance x is given by $K=\frac{Bx}{x^2+A^2}$ the dimensions of B are the same as that of

(1) work/time (2) work × distance (3) work/distance (4) work × time

63. The dimensions of universal gas constant are

1) $\left[L^2M^1T^{-2}K^{-1}mol^{-1}\right]$ 2) $\left[L^1M^2T^{-2}K^{-1}mol^{-1}\right]$ 3) $\left[L^1M^1T^{-2}K^{-1}mol^{-1}\right]$ 4) $\left[L^2M^2T^{-2}K^{-1}mol^{-1}\right]$

64. The volume V of water passing any point of a uniform tube during t seconds is related to the cross – sectional area A of the tube and velocity u of water by the relation $V\propto A^{\alpha}u^{\beta}t^{\gamma}$. Which one of the following will be true?

1) $\alpha=\beta=\gamma$ 2) $\alpha\neq\beta=\gamma$ 3) $\alpha=\beta\neq\gamma$ 4) $\alpha\neq\beta\neq\gamma$

65. Given that $(\alpha/p\beta)=az/K_B\theta$ where p is pressure, z is distance, KB is Boltzmann constant and θ is temperature, the dimensions of β are

1) $\left[L^0M^0T^0\right]$ 2) $\left[L^1M^{-1}T^2\right]$ 3) $\left[L^2M^0T^0\right]$ 4) $\left[L^{-1}M^1T^{-2}\right]$

66. The position x of a particle at time t is given by $x = \frac{V_0}{a}\left(1 - e^{-at}\right)$, where V_0 is constant and a > 0. The dimensions of V_0 and a are

1) M^0LT^{-1} and T^{-1} 2) M^0LT^0 and T^{-1} 3) M^0LT^{-1} and LT^{-2} 4) M^0LT^{-1} and T

67. Given as : h = $\frac{2S\cos\theta}{r\rho g}$ where S is the surface tension of liquid, r is the radius of capillary tube, ρ is density and g is acceleration due to gravity then dimensional formula for S is:

1) $\left[ML^0T^{-2}\right]$ 2) $\left[M^0LT^{-2}\right]$ 3) $\left[ML^2T^{-2}\right]$ 4) $\left[M^0L^0T^{-3}\right]$

68. The velocity v of a particle at time t is given by $v = at + \frac{b}{t+c}$ The dimensions of a, b c are respectively

1) $\left[LT^{-2}\right][L][T]$ 2) $\left[L^2\right],[T]$ and $\left[LT^2\right]$ 3) $\left[LT^2\right],[LT]$ and $[L]$ 4) $[L],[LT]$ and $\left[T^2\right]$

69. In the equation $X = 3YZ^2$, X and Z are dimensions of capacitance and magnetic induction respectively. In MKSQ system, the dimensional formula for Y is

1) $\left[M^{-3}L^{-2}T^{-2}Q^{-4}\right]$ 2) $\left[ML^{-2}\right]$ 3) $\left[M^{-3}L^{-2}Q^4T^8\right]$ 4) $\left[M^{-3}L^{-2}Q^4T^4\right]$

70. The frequency of vibration f of a mass m suspended from a spring of spring constant k is given by a relation of the type $f = cm^xk^y$, where c is a dimensionless constant. The values of x and y are

1) $x = \frac{1}{2}, y = \frac{1}{2}$ 2) $x = -\frac{1}{2}, y = -\frac{1}{2}$ 3) $x = \frac{1}{2}, y = -\frac{1}{2}$ 4) $x = -\frac{1}{2}, y = \frac{1}{2}$

NEET PREVIOUS YEARS QUESTIONS

1. A student measured the diameter of a small steel ball using a screw gauge of least count 0.001cm. The main scale reading is 5mm and zero of circular scale division coincides with 25 divisions above the reference level. If screw gauge has a zero error of -0.004cm, the correct diameter of the ball is (2018)

1) 0.521cm 2) 0.525cm 3) 0.529cm 4) 0.053 cm

2. A physical quantity of the dimensions of length that can be formed out of c, G and $\frac{e^2}{4\pi\varepsilon_0}$ is (c is velocity of light, G is universal constant of gravitation and e is charge) (2017)

1) $c^2\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$ 2) $\frac{1}{c^2}\left[\frac{e^2}{G4\pi\varepsilon_0}\right]^{1/2}$ 3) $\frac{1}{c}G\frac{e^2}{4\pi\varepsilon_0}$ 4) $\frac{1}{c^2}\left[G\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

3. If dimensions of critical velocity v_c of a liquid flowing through a tube are expressed as $\left[\eta^x\rho^yr^x\right]$, where η, ρ and r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x, y and z are given by (2015)

1) -1,-1,1 2) -1,-1,-1 3) 1,1,1 4) 1,-1,-1

4. If energy (E), velocity (V) and time (T) are chosen as the fundamental quantities the dimensional formula of surface tension will be (2015)

1) $\left[EV^{-1}T^{-2}\right]$ 2) $\left[EV^{-2}T^{-2}\right]$ 3) $\left[E^{-2}V^{-1}T^{-3}\right]$ 4) $\left[EV^{-2}T^{-1}\right]$

5. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are : (2014)

1) $\left[FVT^{-1}\right]$ 2) $\left[FVT^{-2}\right]$ 3) $\left[FV^{-1}T^{-1}\right]$ 4) $\left[FV^{-1}T\right]$

6. In an experiment, the percentage of error occurred in the measurement of physical quantities A, B, C and D are 1%, 2%, 3% and 4% respectively. Then the maximum percentage of error in the measurement X, where $X = \frac{A^2B^{1/2}}{C^{1/3}D^3}$, will be: **(NEET-2019)**

(1) $\left(\frac{3}{13}\right)\%$ (2) 16% (3) –10% (4) 10%

7. The main scale of a vernier calliper has n divisions/cm. n divisions of the vernier scale coincide with (n –1) divisions of main scale. The least count of the vernier calliper is, **[NEET – 2019 (ODISSA)]**

1) $\frac{1}{(n+1)(n-1)}cm$ 2) $\frac{1}{n}cm$ 3) $\frac{1}{n^2}cm$ 4) $\frac{1}{n(n+1)}cm$

8. The angle of 1' (minute of arc) in radian is nearly equal to **(NEET-2020 COVID-19)**

(1) 2.91×10^{-4} rad (2) 4.85×10^{-4} rad (3) 4.80×10^{-6} rad (4) 1.75×10^{-2} rad

9. Time intervals measured by a clock give the following readings:
1.25 s, 1.24 s, 1.27 s, 1.21 s and 1.28 s.
What is the percentage relative error of the observations? **(NEET-2020 COVID-19)**
(1) 2 % (2) 4 % (3) 16 % (4) 1.6 %

10. Dimensions of stress are: (NEET-2020)
1) $\left[ML^{-1}T^{-2}\right]$ 2) $\left[MLT^{-2}\right]$ 3) $\left[ML^2T^{-2}\right]$ 4) $\left[ML^0T^{-2}\right]$

11. Taking into account of the significant figures, what is the value if 9.99m – 0.0099m? **(NEET-2020)**
1) 9.9 m 2) 9.9801m 3) 9.98m 4) 9.980m

12. If force [F], acceleration [A] and time [T] are chosen as the fundamental physical quantities. Find the dimensions of energy. **[NEET-2021]**
1) $[F][A][T^2]$ 2) $[F][A][T^{-1}]$ 3) $[F][A^{-1}][T]$ 4) $[F][A][T]$

13. A screw gauge gives the following readings when used to measure the diameter of a wire
Main scale reading: 0 nm
Circular scale reading: 52 divisions
given that 1 mm on main scale corresponds to 100 divisions on the circular scale. The diameter of the wire from the above data is **[NEET-2021]**
1) 0.026 cm 2) 0.26 cm 3) 0.052 cm 4) 0.52 cm

14. If E and G respectively denote energy and gravitational constant, then $\frac{E}{G}$ has the dimensions of: **[NEET-2021]**
1. $\left[M\right]\left[L^{-1}\right]\left[T^{-1}\right]$ 2. $\left[M\right]\left[L^0\right]\left[T^0\right]$ 3. $\left[M^2\right]\left[L^{-2}\right]\left[T^{-1}\right]$ 4. $\left[M^2\right]\left[L^{-1}\right]\left[T^0\right]$

15. The dimensions $\left[MLT^{-2}A^{-2}\right]$ belong to the: **[NEET-2022]**
1) Magnetic flux 2) Self inductance
3) Magnetic permeability 4) Electric permittivity

16. Plane angle and solid angle have: **[NEET-2022]**
1) Units but no dimensions 2) Dimensions but no units
3) No units and no dimensions 4) Both units and dimensions

17. The area of a rectangular field (in m2) of length 55.3 m and breadth 25 m after rounding ff the value for correct significant digits is: **[NEET-2022]**
(1) 138×10^1 (2) 1382 (3) 1382.5 (4) 14×10^2

18. Match List-I with List-II **[NEET-2022]**

List-I	List-II
a) Gravitational constant (G)	(i) $\left[L^2T^{-2}\right]$
b) Gravitational Potential energy	(ii) $\left[M^{-1}L^3T^{-2}\right]$
c) Gravitational Potential	(iii) $\left[LT^{-2}\right]$
d) Gravitational intensity	(iv) $\left[ML^2T^{-2}\right]$

Choose the correct answer from the options given below

	a	b	c	d
1)	ii	i	iv	iii
2)	ii	iv	i	iii
3)	ii	iv	iii	i
4)	iv	ii	i	iii

NCERT LINE BY LINE QUESTIONS – ANSWERS

1) d	2) c	3) a	4) 2	5) d	6) a	7) c	8) d	9) b	10) c
11) a	12) c	13) c	14) d	15) d	16) a	17) b	18) a	19) c	20) b
21) a	22) d	23) d	24) 1	25) c	26) d	27) c	28) a	29) a	30) b

NCERT BASED PRACTICE QUESTIONS- ANSWERS

1) c	2) a	3) c	4) b	5) b	6) a	7) a	8) c	9) a	10) d
11) c	12) b	13) b	14) c	15) d	16) b	17) c	18) a	19) a	20) b
21) c	22) b	23) a	24) c	25) c	26) b	27) d	28) d	29)c	30) a
31) a	32)c	33)b	34)a	35)a	36) b	37)d	38)d	39)a	40)a

TOPIC WISE PRACTICE QUESTIONS – ANSWERS

1) 3	**2)** 4	**3)** 3	**4)** 4	**5)** 1	**6)** 1	**7)** 2	**8)** 4	**9)** 1	**10)**3
11)2	**12)**2	**13)**2	**14)**3	**15)**3	**16)**2	**17)**3	**18)**4	**19)**2	**20)**3
21)1	**22)**3	**23)**3	**24)**3	**25)**2	**26)**4	**27)**2	**28)**3	**29)**3	**30)**1
31)3	**32)**2	**33)**3	**34)**3	**35)**3	**36)**2	**37)**2	**38)**1	**39)**3	**40)**3
41)4	**42)**1	**43)**4	**44)**3	**45)**1	**46)**1	**47)**1	**48)**2	**49)**4	**50)**4
51)3	**52)**3	**53)**4	**54)**3	**55)**2	**56)**1	**57)**4	**58)**1	**59)**3	**60)**2
61)1	**62)**2	**63)**1	**64)**2	**65)**3	**66)**1	**67)**1	**68)**1	**69)**4	**70)**4

NEET PREVIOUS YEARS QUESTIONS-ANSWERS

1) 3	**2)** 4	**3)** 4	**4)** 2	**5)** 4	**6)** 2	**7)** 3	**8)** 2	**9)** 4	**10)** 1
11) 3	**12)** 1	**13)** 3	**14)** 4	**15)** 3	**16)** 1	**17)** 4	**18)** 2		

TOPIC WISE PRACTICE QUESTIONS – SOLUTIONS

1) 3) $R = \rho\frac{l}{A} \therefore \rho = \frac{RA}{l}$

2) 4) Temperature is one of the basic physical quantities

3) 1) Potential is work done per unit charge

4) 4) conductance, $G = \frac{1}{resis\tan ce} = mho\left(\Omega^{-1}\right) or\ Siemen\left(S\right)$

5) 1) From Biot Savart's law

$$B = \frac{\mu_0}{4\pi}\frac{idl\sin\theta}{r^2}$$

$$\mu_0 = \frac{4\pi Br^2}{i\,dl\sin\theta} = \frac{Wbm^{-2}m^2}{Am} = WbA^{-1}m^{-1}$$

6) 1) The henry (symbolized H) is the Standard International (SI) unit of coefficient of mutual inductance of a coil

7) 2) 1 Dyne = 10^{-5}N and 1 cm = 10^{-2}m so, S = 70 dyne/cm=

$$\frac{70\times10^{-5}\,\text{N}}{10^{-2}\,\text{m}} = 70\times10^{-3}\,\text{N/m} \Rightarrow \text{S} = 7\times10^{-2}\,\text{N/m}$$

8) 4) Joule second is the unit of angular momentum

9) 1) Stefan – Boltzman constant = $Wm^{-2}k^{-4}$ = w/m^2k^4

10) 3) It is given that Young's modulus (Y) is

$Y = 1.9\times10^{11}\,N/m^2$

1N = 10^5 dyne

So, $Y = 1.9\times10^{11}\times10^5\,dyne/m^2$

Convert meter to centimeter $\because 1m = 100cm$

$Y = 1.9\times10^{11}\times10^5\,dyne/(100)^2\,cm^2 = 1.9\times10^{12}\,dyne/cm^2$

11) 2) the unit of the Electric field is N/C or V/m.

The unit of the magnetic field is Weber.

The unit of power is Watt.

The unit of the Capacitance is Farad.

12) 2) $\frac{N}{m^2} = \frac{10^5\,dynes}{10^4\,cm^2} = 10\,dynes/cm^2 = 10\beta$

13) 2) As $\frac{a}{V^2} = P$

$$\therefore a = PV^2 = \frac{dyne}{cm^2}\left(cm^3\right)^2 = dyne\times cm^4$$

14) 3) $n_2 = 100\left(\frac{gm}{10^3\,gm}\right)^1\left(\frac{cm}{m}\right)^1\left(\frac{\sec}{\min}\right)^{-2} = 100\left(\frac{gm}{10^3\,gm}\right)^1\left(\frac{cm}{10^2\,cm}\right)^1\left(\frac{\sec}{60\sec}\right)^{-2}$

$$n_2 = \frac{3600}{10^3} = 3.6$$

15. 3) $\frac{eV}{T} = \frac{W}{T} = \frac{PV}{T} = R$ *and* $\frac{R}{N}$ = Boltzmann constant

16. 2) Trigonometric ratios are a number and hence unit less

17. 3) Unit of x = bt^2. Hence unit of b = x/t^2 = km/s^2

18. 4) the correct unit of surface tension is newton/metre

19. 2) The work done = force × displacement

$\therefore unit, u_1 = Fs$ and $u_2 = 4F\times4s = 16u$

20. 3) $n_1u_1 = n_2u_2$; $\therefore n_2 = n_1\frac{u_1}{u_2} = 8\left[\frac{1}{20}\right]\left[\frac{5}{1}\right]^3 = 50$

21. 1) Random errors cannot be eliminated altogether even after taking utmost care. It can only be reduced by taking more number of observations

22. 3) $V = \frac{4}{3}\pi r^3; \frac{\Delta V}{V}\times100 = 3\left(\frac{\Delta r}{r}\right)\times100 = 3\times1\% = 3\%$

23. 3) Maximum absolute error is $\Delta a + \Delta b$. Therefore the percentage error = $\frac{absolute\ error}{actual\ value}\times100$

24. 3) In multiplication or division the final result should return as many significant figures as there are in the original number with the least significant figures.

25. 2) in a product, percentage errors are added up

26. 4) $V = \frac{m}{d} \Rightarrow \frac{\Delta V}{V}\times100 = \frac{\Delta m}{m}\times100 + \frac{\Delta d}{d}\times100 = 3\% + 1\% = 4\%$

27. 2)The significant number in the potential, V = iR; should be the minimum of either i or R. So corresponding to
i=3.23A, we have only three significant numbers in V = 35.02935V. Thus the result is V = 35.0V

28. 3) Momentum of the body is mv = $3.513\text{kg}\times 5.00\text{m/s} = 17.565\text{kgm/s}$
However, the accuracy of the result would be determined by the most inaccurate observation, which is speed with three significant digits. Thus the answer would be expressed in three significant digits, that is, 17.6 kgm/s

29. 3) From $T = 2\pi\sqrt{\frac{l}{g}}; g = 4\pi^2\frac{l}{T^2}$

$$\frac{\Delta g}{g} = \frac{\Delta l}{l} + \frac{2\Delta T}{T} = (y + 2x)$$

30) 1) % error = $\frac{0.01}{0.5}\times 100 + \frac{0.01}{1.0}\times 100 + \frac{0.01}{0.5}\times 100 = 2+1+2 = 4+1 = 5$

31. 3) $l_1 - l_2 = (3.323 \pm 0.001) - (3.321 \pm 0.001) = (0.002 \pm 0.002)\,cm$

32. 2) Relative density = $\frac{\text{Weight of body in air}}{\text{Loss of weight in water}} = \frac{5.00}{5.00-4.00} = \frac{5.00}{1.00}$

$$\frac{\text{Weight of body in air}}{\text{Loss of weight in water}} = \frac{5.00}{5.00-4.00} = \frac{5.00}{1.00}$$

$$\frac{\Delta\rho}{\rho}\times 100 = \left(\frac{0.05}{5.00} + \frac{0.05}{1.00}\right)\times 100 = (0.01 + 0.05)\times 100 = 0.06\times 100 = 6\%$$

$\therefore$ Relative density = $5.00 \pm 6\%$

33. 3) $X = M^x L^{-y} T^{-z}$

$$\therefore \frac{\Delta X}{X}\times 100 = x\left(\frac{\Delta M}{M}\times 100\right) + y\left(\frac{\Delta L}{L}\times 100\right) + z\left(\frac{\Delta T}{T}\times 100\right)$$

(Errors are always added)

$$\therefore \frac{\Delta X}{X}\times 100 = (ax + by + cz) \text{ per cent}$$

34. 3) $E = \frac{1}{2}mv^2$

$$\therefore \frac{\Delta E}{E}\times 100 = \frac{\Delta m}{m}\times 100 + 2\frac{\Delta V}{V}\times 100 = 2\% + 2\times 3\% = 8\%$$

35. 3) The percentage error $= \frac{1}{5}\times\frac{100}{25} = 0.8\%$

36. 2) thickness of wall = $= \frac{1}{2}(4.23 - 3.87) \pm (0.01 + 0.01)$

37. 2) $r = \frac{1.933}{2} = 0.9665 \approx 0.966cm$

38. 1) percentage error in X = $a\alpha + b\beta + c\gamma$

39. 3) $T = 2\pi\sqrt{\frac{l}{g}}, g \propto \frac{l}{T^2}$

$$\therefore \frac{\Delta g}{g}\times 100 = 0.3\% + 2\times 0.1\% = 0.5\%$$

40. 3) Relative error in surface area, $\frac{\Delta s}{s} = 2\times\frac{\Delta r}{r} = \alpha$ and relative error in volume, $\frac{\Delta v}{v} = 3\times\frac{\Delta r}{r}$
$\therefore$ relative error in volume w.r.t relative error in area

$\frac{\Delta v}{v}=\frac{3}{2}\alpha$

41. 4) Density = Mass/Volume

$\rho=\frac{M}{L^3},\frac{\Delta\rho}{\rho}=\frac{\Delta M}{M}+3\frac{\Delta L}{L}$

% error in density = % error in Mass + 3 (% error in length) = 4+3(3) = 13%

42. 1)The mean value of refractive index, $\mu=\frac{1.34+1.38+1.32+1.36}{4}=1.35$ and

$\Delta\mu=\frac{\left|(1.35-1.34)\right|+\left|(1.35-1.38)\right|+\left|(1.35-1.32)\right|+\left|(1.35-1.36)\right|}{4}=0.02$ thus

$\frac{\Delta\mu}{\mu}\times100=\frac{0.02}{1.35}\times100=1.48$

43. 4)density, $\rho=\frac{M}{V}=\frac{M}{\pi r^2 l}$

$\therefore\frac{\Delta\rho}{\rho}\times100=\left[\frac{\Delta M}{M}+\frac{2\Delta r}{r}+\frac{\Delta l}{l}\right]\times100=\left[\frac{0.003}{0.3}+2\frac{0.005}{0.5}+\frac{0.06}{6}\right]\times100=4$

44. 3) $\frac{\Delta P}{P}\times100=\frac{\Delta F}{F}\times100+2\frac{\Delta l}{l}\times100=4\%+2\times2\%=8\%$

45. 1) Since percentage increase in length = 2% Hence, percentage increase in area of square sheet = $2\times2\%=4\%$

46. 1) $\sin\theta=\sqrt{\frac{I}{I_0}}$

Differentiating the above equation,

$\cos\theta d\theta=\frac{1}{2}\frac{1}{I^{3/2}I_0^{1/2}}$ thus $d\theta=\frac{1}{2I}\tan\theta dI\Rightarrow\frac{d\theta}{\theta}=\frac{\tan\theta dI}{2\theta I}$ put $\theta=30\times\frac{\pi}{180}$ radians, $dI=0.002, I=5,$

percentage error in angle = $\frac{d\theta}{\theta}\times100\%=\frac{4\sqrt{3}}{\pi}\times10^{-2}\%$

47. 1)

Given that: $f=x^2$

Hence, $\frac{df}{dx}=2x$

Therefore: $\Delta f=\frac{df}{dx}\Delta x=2x\Delta x$

The relative error in f is:

$\frac{\Delta f}{f}=\frac{2x\Delta x}{x^2}$

$\frac{\Delta f}{f}=\frac{2\Delta x}{x}$

48. 2) Density is the ratio of mass and volume

D = m/V

V = m/d
V = 210/7.981
V= $26.312 cm^3$
The LEAST number of significant figures in any number of the problem determines the number of significant figures in the answer. So the answer is 26.3

49. 4) Electric flux $\phi_E = \vec{E}.\vec{S}$ $\therefore$ dimensionally $\phi_E \neq E$

50. 4) Gravitational constant also known as universal gravitational constant has a symbol G and has a dimension $\left[M^{-1}L^{3}T^{-2}\right]$ while others are dimensionless constant.

51. 3)We know that $\frac{Q^2}{2C}$ is energy of capacitor so it represent the dimension of energy $= \left[ML^2T^{-2}\right]$

52. 3) $\frac{h}{e^2} = \frac{ML^2T^{-1}}{(AT)^2} = ML^2T^{-3}A^{-2} =$ Resistance (ohm)

53. 4) Energy incident per unit area per second

$$= \frac{Energy}{area \times \sec ond} = \frac{ML^2T^{-2}}{L^2T} = MT^{-3}$$

54. 3) $X = Force \times density$

$$\left[MLT^{-2}\right]\frac{[M]}{[L^3]} = \left[M^2L^{-2}T^{-2}\right]$$

55. 2) Mutual inductance = $\frac{\phi}{I} = \frac{BA}{I}$

$$[Henry] = \frac{\left[MT^{-1}Q^{-1}L^2\right]}{\left[QT^{-1}\right]} = ML^2Q^{-2}$$

56. 1) Impulse = change in momentum

57. 4) $[V] = \left[\frac{W}{Q}\right] = \frac{ML^2T^{-2}}{AT} = ML^2A^{-1}T^{-3}$

58. 1) Energy stored in an inductor = $\frac{1}{2}Li^2 = \left[ML^2T^{-2}\right]$

59. 3) u = initial velocity = $\left[M^0L^1T^{-1}\right]$ The dimension of $S_{n^{th}}$ is same as that of $u \times 1\sec$ .Hence, $\left[M^0L^1T^0\right]$

60 2) $\frac{aV}{RT} =$ dimensionless $\Rightarrow a \propto \frac{RT}{V}$.....(1)

Now, $\frac{RT}{v-b} \propto \frac{RT}{v} \propto p$ (dimensionally)……(2)Hence, from (1) and (2) dimension of a is same as P.

61. 1) Let mass, related as $M \propto T^x C^y h^z$

$$M^1L^0T^0 = \left(T'\right)^x\left(L^1T^{-1}\right)^y\left(M^1L^1T^{-1}\right)^z$$

$$M^1L^0T^0 = M^zL^{y+z} + T^{x-y-z}$$

$z = 1, y + z = 0, y = -1$

$x - y - z = 0$ $x = 0$

$M = \left[C^{-1}h\right]$

62. 2)From $K = \frac{Bx}{x^2 + A^2} = \frac{Bx}{x^2} = \frac{B}{x}$

$\therefore B = K \times x =$ K.E.$\times$ distance = work $\times$ distance

63. 1) $R = \frac{PV}{\mu T} = \frac{W}{\mu T} = \frac{ML^2T^{-2}}{\text{mol K}} = \left[M^1L^2T^{-2}K^{-1}\text{mol}^{-1}\right]$

64. 2) The dimensions of the two sides of pro portionality are $L^3 = L^{2\alpha}\left(LT^{-1}\right)^{\beta} T^{\gamma} = L^{2\alpha+\beta}T^{\gamma-\beta}$

Equating the powers of dimensions on both sides, we have $2\alpha+\beta = 3\gamma-\beta = 0$

which gives $\beta \square \gamma$ and $\alpha = 1/2\ (3-\beta)$, i.e. $\alpha \neq \beta = \gamma$.

65. 3)

66. 1) Here, at is dimensionless

$$\Rightarrow a = \frac{1}{t} = \left[\frac{1}{T}\right] = \left[T^{-1}\right] \text{ and } V_0 = xa = \left[LT^{-1}\right] = \left[M^0LT^{-1}\right]$$

67. 1) $S = \frac{F}{l} = \frac{mLT^{-2}}{L} = m^1L^0T^{-2}$

68. 1) As c is added to t, $\therefore c = [T]$

$$a = \frac{v}{t} = \frac{LT^{-1}}{T} = \left[LT^{-2}\right], b = v(t+c) = LT^{-1} \times T = [L]$$

69. 4) $[Y] = \frac{[X]}{\left[Z^2\right]} = \frac{M^{-1}L^{-2}T^4A^2}{M^2T^{-4}A^{-2}} = M^{-3}L^{-2}Q^4T^4$

70. 4) $f = cm^xk^y$;

Spring constant k = force/length.

$$\left[M^0L^0T^{-1}\right] = \left[M^x\left(MT^{-2}\right)^y\right] = \left[M^{x+y}T^{-2y}\right] \Rightarrow x+y=0, -2y=-1 \text{or } y=\frac{1}{2} \text{and } x=-\frac{1}{2}$$

NEET PREVIOUS YEARS QUESTIONS-EXPLANATIONS

1. 3) Diameter of the ball = MSR + CSR $\times$ (l east count) – zero error

= 0.5cm + 25 $\times$0.001 – (-0.004)= 0.5 + 0.025 + 0.004 = 0.529 cm

2. 4) Let dimensions of length is related as,

$$L = [c]^x[G]^y\left[\frac{e^2}{4\pi\varepsilon_0}\right]^z$$

$$\frac{e^2}{4\pi\varepsilon_0} = ML^3T^{-2}$$

$$L = \left[LT^{-1}\right]^x\left[M^{-1}L^3T^{-2}\right]^y\left[ML^3T^{-2}\right]^z$$

$$[L] = \left[L^{x+3y+3z}M^{-y+z}T^{-x-2y-2z}\right]$$

Comparing both sides

-y + z = 0 $\Rightarrow y = z$ ……(i)

x + 3y + 3z = 1 ……..(ii)

-x – 4z = 0 $(\because y = z)$…….(iii)

From (i), (ii), (iii)

Z = y = 1/2, x = -2

Hence, L = $c^{-2}\left[G.\frac{e^2}{4\pi\varepsilon_0}\right]^{1/2}$

3. (4) Applying dimensional method:

$$v_c = \eta^x\rho^y r^z$$

$$\left[M^0LT^{-1}\right] = \left[ML^{-1}T^{-1}\right]^x\left[ML^{-3}T^0\right]^y\left[M^0LT^0\right]^z$$

Equating power both sides

$x+y=0; -x=-1 \therefore x=1$

$1+y=0 \therefore y=-1$; $-x-3y+z=1$

$-1-3(-1)+z=1$; $-1+3+z=1$

$\therefore z=-1$

4) b) let surface tension

$s=E^aV^bT^c$

$$\frac{MLT^{-2}}{L}=\left(ML^2T^{-2}\right)^a\left(\frac{L}{T}\right)^b(T)^C$$

Equating the dimension of LHS and RHS

$ML^0T^{-2}=M^aL^{2a+b}T^{-2a-b+c}$

$\Rightarrow a=1, 2a+b=0, -2a-b+c=-2 \Rightarrow a=1, b=-2, c=-2$

Hence, the dimensions of surface tension are $\left[EV^{-2}T^{-2}\right]$

5. 4) Force = mass × acceleration $\Rightarrow [Mass]=\left[\frac{force}{acceleration}\right]=\left[\frac{force}{velocity/time}\right]=\left[FV^{-1}T\right]$

6.

$$x=\frac{A^2B^{1/2}}{C^{1/3}D^3}$$

$$\frac{\Delta x}{x}=\frac{2\Delta A}{A}+\frac{1}{2}\frac{\Delta B}{B}+\frac{1}{3}\frac{\Delta C}{C}+3\frac{\Delta D}{D}$$

$$\frac{\Delta x}{x}\times 100=2(1\%)+\frac{1}{2}(2\%)+\frac{1}{3}(3\%)+3(4\%)=16\%$$

7.

$n(VSD)=(n-1)MSD$

$\Rightarrow 1VSD=\frac{(n-1)}{n}MSD$

Least count $=1MSD-1VSD=\left[1-\frac{(n-1)}{n}\right]$

$MSD=\frac{1}{n}MSD$

$=\frac{1}{n}\left(\frac{1}{n}\right)cm$

$=\frac{1}{n^2}cm$

8. 1) $1^{'}=\left(\frac{1}{60}\right)^0=\frac{1}{60}\times\frac{\pi}{180}$ radian

9. 4) Mean of observation $=\frac{1.25+1.24+1.27+1.21+1.28}{5}=1.25s$

Mean absolute error $=\frac{0+0.01+0.02+0.04+0.03}{5}=0.02s$

% Error $=\frac{0.02}{1.25}\times 100=1.6\%$

10. 1) DF of stress $=\frac{F}{A}=\frac{MLT^{-2}}{L^2}$; Stress = $[ML^{-1}T^{-2}]$

11. 3) 9.99 – 0.0099= 9.99 – 0.009 = 9.981

Here minimum number of decimal places = 2
So other numbers should be rounded off up to 3 decimal places.
Answer should be rounded off up to '2' decimal places.
Ans = 9.98

12. 1)E = F.S $\Rightarrow S = \frac{1}{2}at^2$; $E = [FAT^2]$

13. 3)Reading = M.S.R +[C.S.R(L.C)] =0+ 52 $\times \frac{1mm}{100}$ =0.052 cm

14. 4)

$$E = \frac{Gm_1m_2}{R}$$

$$\left[\frac{E}{G}\right] = \left[\frac{m^2}{R}\right] = \left[M^2L^{-1}T^0\right]$$

15.: Magnetic permeability $\rho = MLT^{-2}A^{-2}$

16. Plane angle and sound angle have unit but no dimension

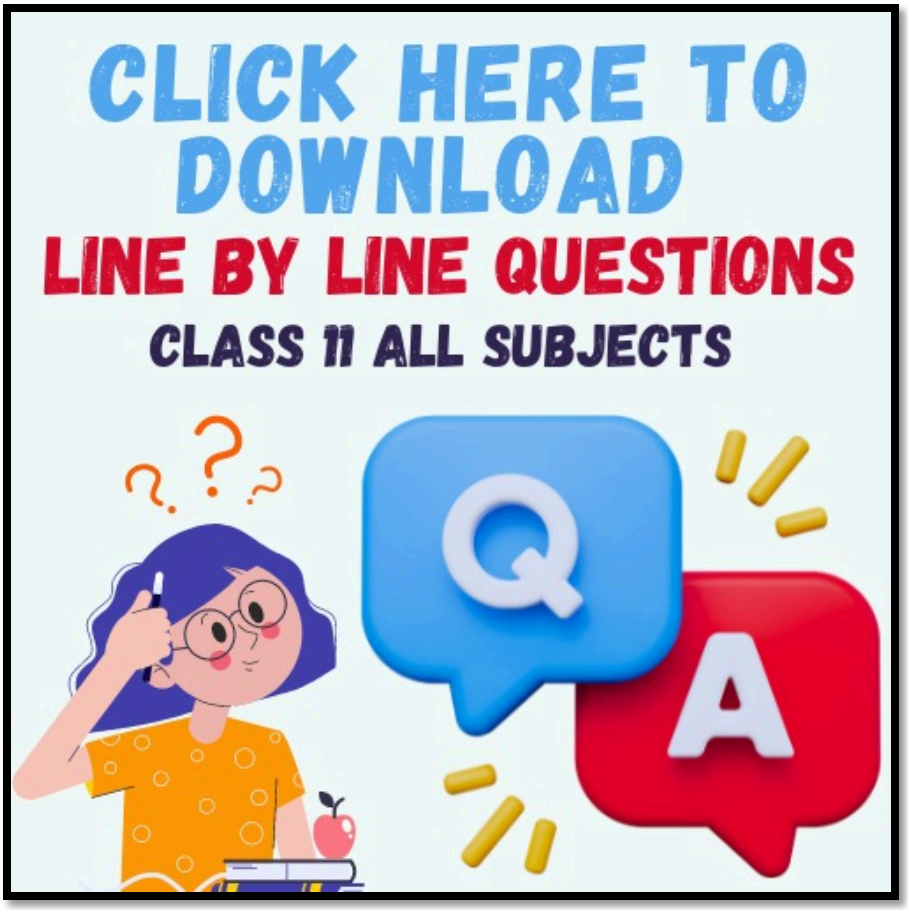
17. $A = L \times 6$
$= 55.3 \times 25$
$= 1382.5\,m^2$
$= 14 \times 10^2\,m^2$

18. Gravitational Constant $G\left(M^{-1}L^3T^{-2}\right)$

Gravitational PE $\left(M^1L^2T^{-2}\right)$

Gravitational Potential $\left(M^0L^2T^{-2}\right)$

Gravitational Intensity $\left(L^1T^{-2}\right)$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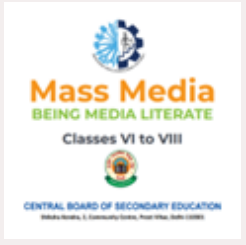

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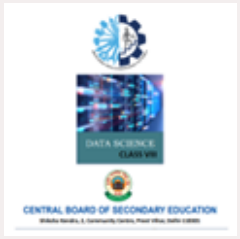

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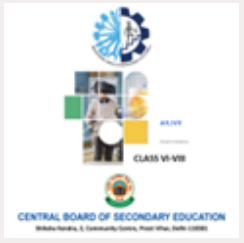

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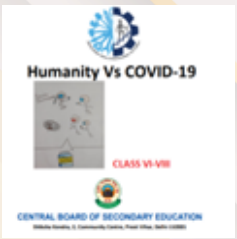
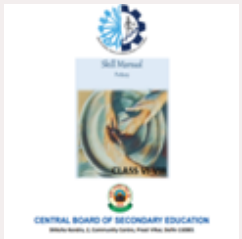


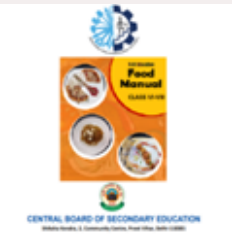
Humanity & Covid-19

Blue Pottery

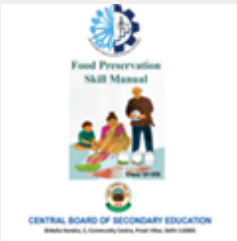


Pottery

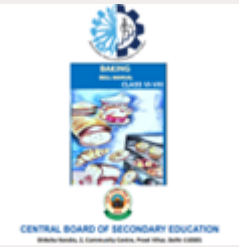
Block Printing



Food



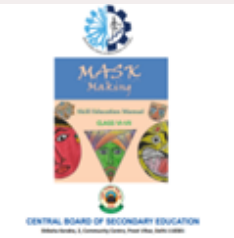
Food Preservation



Baking

Herbal Heritage

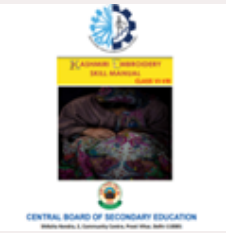
Khadi



Mask Making

Mass Media

Making of a Graphic Novel



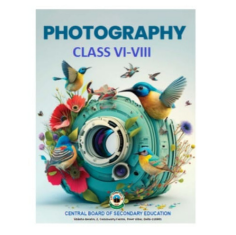
Kashmiri Embroidery

Embroidery

Rockets

Satellites

Application of Satellites

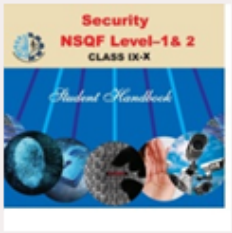


Photography

SKILL SUBJECTS AT SECONDARY LEVEL (CLASSES IX – X)

Retail

Information Technology



Security

Automotive

Introduction To Financial Markets

Introduction To Tourism

Beauty & Wellness

Agriculture

Food Production

Front Office Operations

Banking & Insurance

Marketing & Sales

Health Care

Apparel

Multi Media

Multi Skill Foundation Course

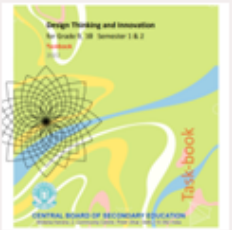
Artificial Intelligence

Physical Activity Trainer

Data Science

Electronics & Hardware (NEW)

Foundation Skills For Sciences (Pharmaceutical & Biotechnology)(NEW)



Design Thinking & Innovation (NEW)

SKILL SUBJECTS AT SR. SEC. LEVEL (CLASSES XI – XII)

Retail

InformationTechnology

Web Application

Automotive

Financial Markets Management

Tourism

Beauty & Wellness

Agriculture

Food Production

Front Office Operations

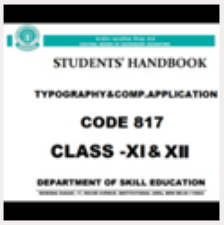
Banking

Marketing

Health Care

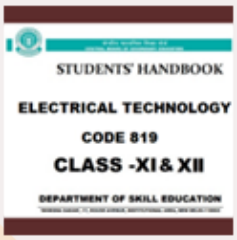
Insurance

Horticulture



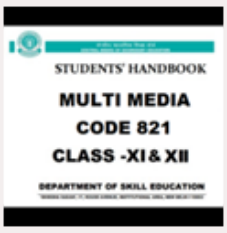
Typography & Comp. Application

Geospatial Technology



Electrical Technology

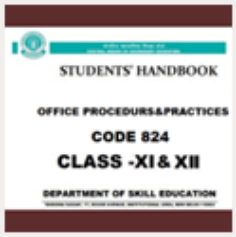
Electronic Technology



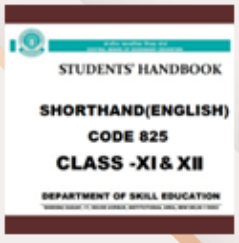
Multi-Media

Taxation

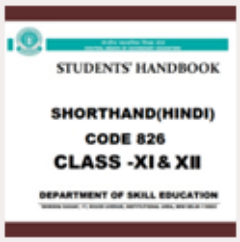
Cost Accounting



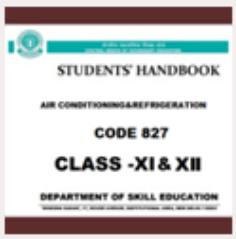
Office Procedures & Practices



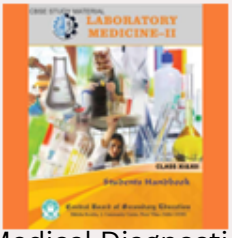
Shorthand (English)



Shorthand (Hindi)



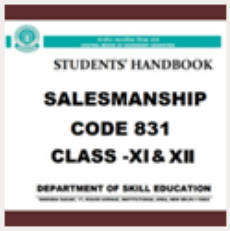
Air-Conditioning & Refrigeration



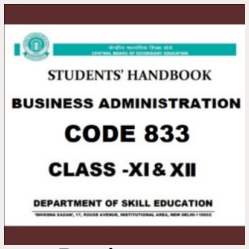
Medical Diagnostics

Textile Design

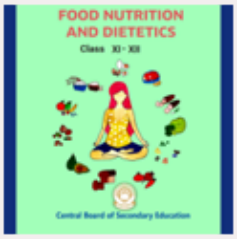
Design



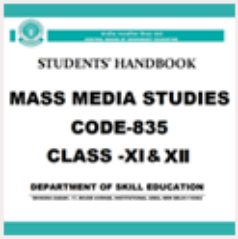
Salesmanship



Business Administration



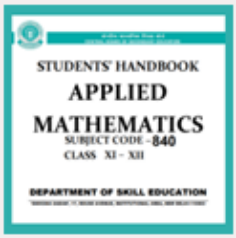
Food Nutrition & Dietetics



Mass Media Studies

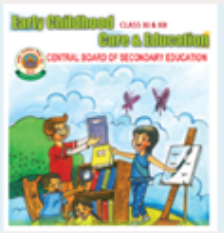
Library & Information Science

Fashion Studies



Applied Mathematics

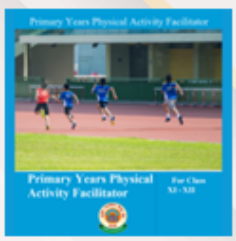
Yoga



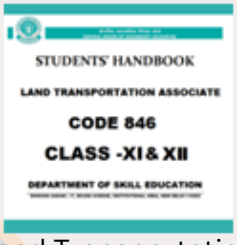
Early Childhood Care & Education

Artificial Intelligence

Data Science



Physical Activity Trainer(new)



Land Transportation Associate (NEW)

Electronics & Hardware (NEW)

Design Thinking & Innovation (NEW)